CLAIMS

What is claimed is:

1. A heat spreader having a top surface and a bottom surface, comprising:

a bypass capacitor embedded within the heat spreader, the bypass capacitor having a first plate, a second plate, a dielectric between the first and second plates, a first terminal coupled to the first plate, and a second terminal coupled to the second plate, wherein the first terminal and the first plate are electrically insulated from the second terminal and the second plate.

2. The heat spreader of claim 1, wherein the bypass capacitor is embedded within a lid of the heat spreader.

3. The heat spreader of claim 2, wherein the bypass capacitor is embedded within the lid where the first and second plates are in a comb-type construction.

4. The heat spreader of claim 2, wherein the bypass capacitor is embedded within the lid where the first and second plates are in a wrapped-type construction.

5. The heat spreader of claim 1, wherein the first terminal and the second terminal are located on the bottom surface of the heat spreader.

6. The heat spreader of claim 2, wherein the lid includes a top cover connected to the first terminal and a bottom cover connected to the second terminal, the top cover being insulated from the bottom cover.

7. The heat spreader of claim 2, wherein the lid is a channel type lid.

8. The heat spreader of claim 1, wherein the bypass capacitor is embedded within a stiffener of the heat spreader.

9. The heat spreader of claim 1, further comprising:

a second bypass capacitor embedded within the heat spreader, the second bypass capacitor having a third plate, a fourth plate, a second dielectric between the third and fourth plates, a third terminal coupled to the third plate, and a fourth terminal coupled to the fourth plate, wherein the third terminal and the third plate are electrically insulated from the fourth terminal and the fourth plate.

10. The heat spreader of claim 9, wherein the second bypass capacitor is embedded within a stiffener of the heat spreader.

11. The heat spreader of claim 10, wherein the second bypass capacitor is embedded within the stiffener where the third and fourth plates are in a comb-type construction.

12. The heat spreader of claim 10, wherein the second bypass capacitor is embedded within the stiffener where the third and fourth plates are in a wrapped-type construction.

13. The heat spreader of claim 1, wherein the first and second plates are made of a material selected from the group consisting of Cu, Al, Pt, and Au.

14. The heat spreader of claim 1, wherein the first and second dielectrics have a dielectric constant in the range of 10 and 1000.

15. A semiconductor device package, comprising:

a die having front and back surfaces;

a package substrate having die and board surfaces;

a thermal adhesive material coupling a heat spreader in accordance with claim 1 to the back surface of the die; and

an adhesive coupling the heat spreader to the die surface of the package substrate.

16. The semiconductor device package of claim 15, wherein the bypass capacitor is embedded within a lid of the heat spreader.

17. The semiconductor device package of claim 16, wherein the bypass capacitor is embedded within the lid where the first and second plates are in a comb-type construction.

18. The semiconductor device package of claim 16, wherein the bypass capacitor is embedded within the lid where the first and second plates are in a wrapped-type construction.

19. The semiconductor device package of claim 15, wherein the first terminal and the second terminal are located on the bottom surface of the heat spreader.

20. The semiconductor device package of claim 16, wherein the lid includes a top cover connected to the first terminal and a bottom cover connected to the second terminal, the top cover being insulated from the bottom cover.

21. The semiconductor device package of claim 16, wherein the lid is a channel type lid.

22. The semiconductor device package of claim 15, wherein the bypass capacitor is embedded within a stiffener of the heat spreader.

23. The semiconductor device package of claim 15, further comprising:

a second bypass capacitor embedded within the heat spreader, the second bypass capacitor having a third plate, a fourth plate, a second dielectric between the third and fourth plates, a third terminal coupled to the third plate, and a fourth terminal coupled to the fourth plate, wherein the third terminal and the third plate are electrically insulated from the fourth terminal and the fourth plate.

24. The semiconductor device package of claim 23, wherein the second bypass capacitor is embedded within a stiffener of the heat spreader.

25. The semiconductor device package of claim 24, wherein the second bypass capacitor is embedded within the stiffener where the third and fourth plates are in a comb-type construction.

26. The semiconductor device package of claim 24, wherein the second bypass capacitor is embedded within the stiffener where the third and fourth plates are in a wrapped-type construction.

27. The semiconductor device package of claim 15, wherein the first and second plates are made of a material selected from the group consisting of Cu, Al, Pt, and Au.

28. The semiconductor device package of claim 15, wherein the first and second dielectrics have a dielectric constant in the range of 10 and 1000.

29. A method of fabricating a heat spreader, comprising:

providing a capacitor, the capacitor having a first plate, a second plate, and a dielectric between the first and second plates; and

encapsulating the capacitor inside a thermally conductive housing, thereby fabricating the heat spreader.

30. The method of claim 29, further comprising:

coupling a first terminal to the first plate; and

coupling a second terminal to the second plate.

31. The method of claim 29, wherein the first and second plates are in a wrapped-type construction.

32. The method of claim 29, wherein the first and second plates are in a comb-type construction.

33. A method of reducing simultaneous switching noise in a semiconductor device package comprising a die, package substrate, and a heat spreader, the method comprising:

embedding a bypass capacitor within the heat spreader, the bypass capacitor having a first plate, a second plate, a dielectric between the first and second plates, a first terminal coupled to the first plate, and a second terminal coupled to the second plate; and

connecting the first and second terminals respectively to a first plane and a second plane, whereby the bypass capacitor reduces simultaneous switching noise when discharged by the die.

34. The method of claim 33, wherein the first plane and second plane are embedded within the package substrate.

35. A semiconductor device package, comprising:

a die having front and back surfaces;

a package substrate having die and board surfaces;

a heat spreader comprising means for reducing simultaneous switching noise in the semiconductor device package;

a thermal adhesive material coupling the heat spreader to the back surface of the die; and

an adhesive coupling the heat spreader to the die surface of the package substrate.